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ABSTRACT

The need for better data on minority women (American Indian, Black, Mexican American, Asian, and Puerto Rican) in science, engineering, and health professions, resulted in a survey of 52 members of the National Network of Minority Women in Science in September 1980. Results of the survey suggest three major educational objectives: (1) to provide all students with the most rigorous mathematics and science education possible; (2) to give students the information necessary to make education possible; (2) to give students the information necessary to make wise decisions regarding education and career; and (3) to motivate students to persist in efforts that are necessary for them to reach their intellectual potentials. Most strategies and solutions were directly aimed at students, such as access to career information; student interaction with appropriate role models; emphasis on the development of self-discipline; and student participation in out-of-school science enrichment activities. Policy recommendations offered were designed to increase number of minority students receiving graduate degrees, facilitate smooth transition from school to work, and coordination of admission policies with retention efforts. Issues of equal opportunity in employment and professional life included career advancement, disparities in salary, promotion, responsibility level and job security. Appendices include questionnaire and tables of survey results. (ERB)

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# PROBLEMS AND SOLUTIONS IN THE EDUCATION, EMPLOYMENT AND PERSONAL CHOICES OF MINORITY WOMEN IN SCIENCE

August 1981

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Paula Quick Hall
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American Association for the Advancement of Science

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*The views expressed are entirely those of the author and survey participants, not necessarily endorsed by Polaroid Corporation or the American Association for the Advancement of Science.

# INTRODUCTION

## The Office of Opportunities in Science

During the early 1970's, the leadership within the American Association for the Advancement of Science realized the need to give some attention to the underrepresentation of women and minorities among U.S. scientists. In 1973, the Committee on Opportunities in Science was appointed to advise the Association on appropriate policies and programs which would enhance the status and accelerate the advancement of women and minorities in all of the science professions. That same year, the Office of Opportunities in Science (OOS) was established to implement those policies as originally outlined by the Committee. In 1975, the scope of OOS programs was expanded to include promotion of access to science for the physically handicapped.

The Committee on Opportunities in Science is concerned that minority, women and handicapped scientists should receive appropriate recognition; that the public image of scientists should increasingly include minority, female and handicapped individuals; that minority, female and handicapped youth should be provided with role models and motivation to seek positions of authority and prestige in the scientific professions; and that educational and professional opportunities truly be open to these groups at all levels. To these ends, the Committee and Office are involved in a variety of activities. Technical assistance, research and demonstration projects, advocacy on behalf of the constituent groups and the convening of meetings to bring together segments of the population to further specific objectives are typical activities of OOS.

The primary beneficiaries of OOS programs are the physically handicapped, women of all races and minority men and women. American Indian, Black, Mexican American and Puerto Rican students and scientists have been the focus of minority programs because of their extreme underrepresentation at every step of the traditional science career path in the United States. Up-to-date statistical descriptions of Hispanic and Black scientists are presented in two papers authored by Betty M. Vetter* and prepared for the Office of Opportunities in Science (available from OOS). A comparable paper on Native Americans is being prepared by Dr. Rayna Green, Director of the Native American Science Resource Center at Dartmouth College.

Our attention to the participation of Asian Americans in science has been limited because of program emphasis on access to science. On most measures of access to science, such as mathematics and science grades, test scores and enrollment in advanced science and mathematics courses, Asians are achieving at rates equal to or higher than their proportion in the U.S. population would suggest. OOS concern about Asian scientists is based on evidence of discrimination in salary, advancement, appointment to prestigious advisory bodies and other aspects of professional status. The factors which impede the progress

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*Betty M. Vetter, Executive Director, Scientific Manpower Commission, Washington, DC.

of Asians and other minority groups in science must be researched and addressed in ways that acknowledge and accommodate both unique and common barriers. Review and analysis of data are the recurrent processes which, along with other kinds of observations, direct and enable evaluation of OOS initiatives. The discrete projects, continuous advocacy and service functions of OOS rely heavily on our knowledge of facts about access to and advancement in science.

In the early stages of OOS activity, it became apparent that although there was increasing public awareness of the need to increase the participation of women and minorities in science, there was often the tendency to ignore the existence of minority women in both groups. Consequently, there were programs to address the underrepresentation of minorities in science which actually focussed on the minority male, and efforts to bring more women into science, which primarily assisted non-minority women. Recognizing the usual failure of either type of targeted program to address the special needs and circumstances of minority women, the AAAS-OOS, in 1975, undertook with National Science Foundation support, a study of minority women scientists. This project, which centered around a conference of thirty minority women scientists and engineers, produced the first comprehensive examination of the training and professional experience of Black, Mexican American, Native American and Puerto Rican women scientists. The Double Bind: The Price of Being a Minority Woman in Science (Malcom, Hall and Brown, 1976) is the report of that project.

In 1978 the OOS convened a larger meeting of minority women scientists to assess progress made since the 1975 conference and design a plan of action to improve the status and increase the participation of minority women in science. At that meeting, the minority women scientists formed a communication network which was to become the basis for mutual support and assistance, and the exchange of information for their professional development and involvement in activities to improve access of minorities to science. This was the birth of the National Network of Minority Women in Science (MWIS).

## The National Network of Minority Women in Science

The National Network of Minority Women in Science has grown and evolved into a communication and support system for Asian, Black, Mexican American, Native American and Puerto Rican women in science and engineering. It has spawned the development of two local groups of minority women in science (in Atlanta, Georgia and in Washington, D.C.), and stimulated enthusiasm in other regions for the organization of local groups. The National Network MWIS maintains membership records, convenes an annual meeting and produces a periodic newsletter for members. Local chapters, with technical assistance from the National Network, function independently as professional organizations with a

strong commitment to improving opportunities for minority males and females in science. Data on membership of the National Network MWIS are presented in Tables I and II of Appendix B.

In the course of OOS projects and MWIS activity, several needs have become apparent. One is the need for a better source of data on minority women in science, engineering and health professions. Because of the relatively small number of minority women in these fields, most data sources which supply statistics on the science and engineering workforce do not identify individuals by race or ethnicity and gender. Those that collect data in sufficient detail to do so typically provide no more than "number of" figures with this degree of specificity, leaving data on employment status, salary, degrees awarded, etc. aggregated in ways that make minority women impossible to "find". Recognizing this problem, OOS has begun discussions with major collectors and publishers of data to find ways of identifying and examining demographic features of minority women in some detail. Simultaneously, we are using the small, but significant, pool of minority women scientists who are part of MWIS as a source of information about the statistically invisible population.

A second need apparent from our observation of recent trends and persisting problems is for some very specific articulation of strategies to improve access to science and opportunities within these professions, in the context of current political and social realities. OOS Regional Forums on Minorities in Science, held earlier this year, are part of our effort to address this need. As data show minority females remaining at the bottom of the status ladder at nearly every stage in the education, training and employment of scientists, it seemed logical to ask minority women scientists in particular to examine a selection of specific issues and to suggest appropriate remedies based on their own experience. The MWIS survey discussed in this report did just that. We know from our involvement with the survey participants that many, if not most, work in some way to improve opportunities for minority youth in their chosen fields in addition to their professional pursuits. We know further that there are, within this group, many highly successful and competent scientists who have overcome most of the barriers to their progress as scientists and are effectively managing a wide variety of personal and professional responsibilities. We are confident, therefore, that although the survey participants are not a statistically selected sample, they offer a credible and highly useful view of the experience of minority women with regard to the issues addressed.

The problems discussed and the solutions proposed are not uniquely applicable to minority women.

> Some factors while possibly shared by women and minorities [and others], may be a greater barrier to one than to the other, e.g. the need for financial aid at

> all levels or the lack of suitable child care services for single parents who are students. Other factors are peculiar to one group or the other, e.g. the language barrier for Hispanic and some American Indian populations or disproportionate tracking of minority students in high school into non-academic programs. It should be remembered that minority women face all of these problems along with the effect of their interaction.*

Thus, we are certain that as the needs defined are addressed, there will be benefits to other groups equal to and possibly exceeding those realized by minority women, since the needs and circumstances of minority women are shared to varying degrees by every "category" of individual. We fully expect that there will be benefits from attention to the issues discussed in this report, enjoyed by the individuals affected and by society as a whole, from the increased contributions of minority women to the progress of science and technology.

## The Survey

The questions which comprised this survey (found in Appendix C) were intended to provide insight into the experience of minority females from the stage of the earliest decisions impacting their access to science, through critical periods in training and into the phase of active professional employment. From the limited statistical evidence available, conference reports of educators' and scientists' views on relevant issues, and our perception of "the problem", seven questions were posed. While we do not pretend to have identified all the barriers or even a fraction of the remedies, there is persuasive evidence that the issues discussed are real and significant factors in the access of minorities to science careers.

The first question dealt with course-taking behavior of high school students. Dr. Lucy Sells has, since 1973, studied enrollments of high school students in mathematics courses and reported her findings by race and gender. Using populations in Maryland and California, Dr. Sells has repeatedly documented the underrepresentation of non-Asian minority students, male and female, in the mathematics courses which are normally prerequisite for college level study in science and engineering. Data recently compiled by the National Center for

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*From Congressional testimony presented by Dr. Shirley Mahaley Malcom to the Senate Committee on Labor and Human Resources on April 7, 1981 in response to questions from Senator Edward Kennedy.

Education Statistics reveals that this is a national problem and that underrepresentation in science courses is a problem of comparable magnitude. Although there is the need for more research to examine the factors which influence course-taking and academic achievement, it is clear from available data that relatively few minority students leave high school adequately prepared for postsecondary education in the sciences.

The second survey question asked about attrition and field switching from science, engineering and mathematics majors in college. The documentation of this problem is virtually nonexistent and is necessarily limited to anecdotal and narrative reports of teachers and researchers of minority students.* We cannot, however, ignore the concerns of minority science faculty who repeatedly warn of the low level of interest and persistance and lack of preparedness for science majors among minority students. So, we asked the question with the presumption that there is a problem of attrition from science and mathematics majors. The extreme underrepresentation among science and mathematics degree recipients at all levels and the absence of comments or evidence to the contrary lead us to believe that our presumption is valid. The need for research on this question is evident.

The third survey question asked for ways of increasing enrollment in and completion of graduate science programs by minority students. Data from the Science Education Data Book, National Science Foundation, 1980 show non-Asian minorities to be grossly underrepresented among degree recipients (1975-76) at every level in science and engineering fields. They comprise an increasingly smaller proportion of degree recipients at each degree level. The problems of underrepresentation in graduate school science and engineering enrollments and the relatively small number of graduate degrees conferred on all but Asian minority students is evident in data published by the Scientific Manpower Commission, National Science Foundation and others.

In each of these survey questions and those that followed, we asked the participants to give their views on effective remedies and, in some instances, to identify the critical issues related to some aspect of "the problem". We sought also to examine their collective perception of the significance of their race and gender in their professional lives. Finally, with the increasing existence of two-career families and speculations and controversy as to the compatibility of science careers

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*The National Longitudinal Study of High School Seniors in 1972 (National Center for Education Statistics) is probably the best source of data on the national patterns of persistance in college by Black and White students, but analyses by race and gender and by college major are not available.

with marriage and/or parenting, we asked the participants' views on the significance of their marital status and the presence or absence of children in their lives.

The survey was sent with a cover letter (Appendix C) to all members of the National Network of Minority Women in Science beginning in September 1980. Fifty-two people completed and returned the survey. A statistical picture of the participants is given in Tables I and II of Appendix D.

This survey has obviously not covered all the relevant issues or disclosed all the aspects of those issues discussed. It has in our view taken cross sections at various stages in the development of scientists and examined in some detail those factors which are of particular importance to minority students and scientists, especially minority women.

There are clearly defined areas where intervention is needed to correct conditions which impede the entry or advancement of minority women in science careers. There are other areas where research is needed to clarify situations or suggest solutions to problems. It is our hope that researchers and policy-makers in local school systems and higher education institutions will join with practitioners and government officials to implement the recommendations of this report which are within their domain. The potential benefits are not just for minority women. It is in the interest of this country as a whole to fully develop and utilize its future manpower resources for industrial productivity, defense, health, well-being and national pride.

## SURVEY ANALYSIS

### Pre-College Education

A well established barrier* to the higher education of minority students in mathematics and science is their failure in high school to enroll in college-preparatory mathematics and science.

A major area of concern is the fact that in most secondary schools, the mathematics and science courses which prepare students for college level study in these fields are optional; in some secondary schools they are not even offered.** The suggestions for reversing the current pattern of course-taking ranged from making pre-college mathematics and science mandatory for all students, to trying in various ways to influence the students' choice of electives.

Survey respondents felt strongly that efforts to change the pre-college education experience of minority students must begin early, even at the pre-school level. With the ultimate goal being to increase the number of minority students with the prerequisites for a college education in mathematics, science or engineering, several immediate objectives were articulated.

First, there are attitudinal factors that influence a student's behavior and achievement in school. The desirable attributes discussed include: (1) high self-esteem; (2) motivation to succeed; (3) high expectations; (4) self-discipline; (5) willingness to assess and take risks; (6) high regard for the value of education and learning; and (7) a realization that worthwhile educational and occupational objectives require hard work and discipline. Activities and experiences specifically designed to develop and enhance these personal characteristics were suggested. Early and substantial interaction with

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*This pattern is documented in research conducted by Dr. Lucy Sells in Maryland and California and in data collected by the U.S. Department of Education, National Center for Education Statistics.

**The Condition of Education, 1980 Edition Statistical Report published by the National Center for Education Statistics reports data on course offerings in schools with grades 7-12 from Report of the 1977 National Survey of Science Mathematics and Social Studies Education, published by Iris R. Weiss, Research Triangle Institute.

appropriate role models* was suggested by fifteen respondents as an important experience. Encouragement by teachers, parents and counselors, science-related presentations by a variety of speakers, and stricter disciplinary practices within schools and homes are examples of proposed means of enhancing attitudes of students. The use of science games and toys was also mentioned as a way of generating interest and enthusiasm for science.

A second area of concern is the quality of the curriculum and extracurricular academic experiences available to students. The importance of an early emphasis on science learning and the use of stimulating and relevant teaching methods and tools were stressed by the respondents. The possibility of teaching pre-school children to recognize and know something about household chemicals and dangerous substances, for example, was suggested as an appropriate "introduction to chemistry". Several techniques and tools for making science courses more interesting and exciting were suggested: (1) extensive use of demonstrations and experiments in which the students participate; (2) symposia and workshops with audio-visual presentations, speakers and demonstrations for students; (3) visits to facilities where scientific research, development and manufacturing are done; (4) use of micro-computers; and (5) use of subject matter which is obviously relevant to the students' lives (such as the urban geology curriculum developed by J.V. O'Connor at the U.S. Geological Survey.) A very strong feeling that the overall quality of science education must be improved** emerged from the responses to this survey.

Supplementary academic programs, such as the NSF-supported Student Science Training Programs and Saturday Science Academies, and

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*Research on role models for women, discussed at the National Research Council Conference on "...Research Concerning Women in Science and Engineering." May 1981, indicates that factors such as age proximity and physical traits of the role model may significantly influence effectiveness. Views regarding the importance of the race and gender of role models for minority students and the positive influence of successful adults in fields other than science have been frequently discussed at meetings on minorities in science, although little research has been done on the subject.

**This point reinforces the assessment presented in Science and Engineering Education for the 1980's and Beyond, prepared by the National Science Foundation and the Department of Education, October 1980 by request of President Jimmy Carter. Despite the negligible attention to the condition of minorities in science, this report does affirm the notion that no matter how poorly most Americans are being educated in the sciences, minority students are being even less well trained.

other out-of-school tutoring or enrichment programs, are considered essential as means of reinforcing, compensating for inadequacies of, or augmenting the regular academic curricula. Most such programs for pre-college level students have, in the past, been conducted at colleges and universities, sometimes sponsored by scientific societies, funded by the educational institutions, the federal government or local industries, at little or no cost to the students. Though the question of the continuance of federal support was raised, there was no doubt expressed as to the value of such programs.

The third area of concern is counseling and the availability of information most important to the students' decision-making. Critical objectives here are to make the student aware of (1) the relationship between high school courses and future career options; (2) the relationship between science and mathematics subject matter and day-to-day living; (3) the existence of job opportunities and the prerequisite training, particularly in science and mathematics-based fields; (4) the benefits and rewards enjoyed by scientists because of their work; (5) the contributions of scientists and science to the well-being of society; and (6) the various characteristics and achievements of institutions of higher education, in particular, minority colleges. While much of this information can be conveyed through traditional counseling and literature, participation in scientific activities and meetings, science fairs and public hearings on environmental issues were suggested as good ways of enhancing this awareness.

Considerable attention was given to the role of teachers and counselors in influencing student course-taking and achievement. The need for incentives and rewards that will encourage minorities and women in particular to become teachers of science and mathematics was asserted. Suggestions were made for enhancing teachers' knowledge of science and mathematics-based occupations and their prerequisites, and influencing attitudes about the abilities of minority students and the appropriateness of science and mathematics-based careers for them. Included among the means suggested were wider dissemination of information about model teaching programs, workshops for counselors and teachers and "consciousness-raising" discussion sessions for these important adults. One respondent suggested workshops, seminars and counseling for parents to influence their attitudes toward the students' education.

In summary, the needs most fervently expressed were (1) to improve the attitudes of both the students and significant adults toward the students' ability and potential; (2) to improve the quality of learning in science and mathematics; and (3) to provide specific kinds of career and education information to students in a timely manner. All efforts to address these needs must begin early and be consistently

available to all students throughout the elementary and secondary school years.

College Education - Attrition and Field-Switching Away From Science and Mathematics

This survey asked specifically what should be done to reduce attrition and field-switching among college students who initially express an interest in science, engineering and related fields. Although there are many aspects of college education that influence the production of minority scientists, the dissipation of the initial enthusiasm for or commitment to science during the college years was a focus of this survey. If the strategies proposed in the preceding section were implemented and were effective, the number of minority students expressing an initial interest in science and mathematics would probably be proportional to their occurrence in the freshman population. The challenge at the college level would then be to maintain that proportionate representation through graduation.

The recommendations in this section are, however, fairly realistic and presume a substantially inequitable pre-college experience and an array of academic, social and psychological disadvantages accompanying the minority freshman. We presume further that the number of minority freshmen expressing an interest in science, engineering or mathematics-based fields would be disproportionately low. In addressing this issue, the respondents reasserted the importance of a strong pre-college education in determining the quality of the college experience, so that field-switching and attrition due to inability to perform at the required level would not occur.

The largest number of comments dealt with the need to strengthen academic achievement, and the responsibility of the college to provide essential academic support services. Twenty respondents identified academic counseling and advisement as crucial. Several scientists suggested that an initial assessment of strengths and weaknesses be made for each student and a curriculum and program of additional services be designed to meet the individuals' needs. Respondents felt that the following academic services should be available: (1) tutoring; (2) participation in group study sessions; and (3) activities to build mathematics and writing skills. Considerable thought was given to the factors that influence the effectiveness of services of this kind. Characteristics of the tutor, counselor or instructor were emphasized. Various respondents suggested use of peer tutors and counselors and the use of ethnic role models as tutors and counselors or mentors. The crucial point is that although these opportunities for academic assistance and enrichment may exist at an institution, they may be underutilized and/or ineffective unless they are provided by persons who are "sensitive to the needs and different stresses minority students

have".* These persons must be perceived by the students as non-threatening and be able to relate comfortably with a diverse student population.

Aspects of the curriculum viewed important are opportunities to participate in research and applied learning experiences. Student symposia in science and mathematics and course-related work experience (out-of-school) were suggested as good enrichment activities.

The monitoring of academic progress for immediate recognition and remediation of problems was suggested. Some respondents proposed making participation in tutorial or counseling sessions mandatory or making receipt of financial assistance contingent on the individual's use of academic support services, if needed. Another view was that financial incentives and awards be used to encourage academic excellence regardless of financial need.

The availability and accessibility of certain kinds of information influence student achievement at the college level. Awareness of the expectations and requirements of academic departments was singled out by several scientists as a key factor. A related area is the understanding or at least awareness of the usual expectations and motivations of majority individuals and institutions (particularly employers) in various training and work settings. Survey respondents suggested that the benefits and rewards of science careers be conveyed to students with meaningful and tangible examples. Exposure to role models in work settings for this type of awareness was mentioned by ten scientists. Presentation of and interaction with female and minority scientists working in the various fields and specialties was suggested as a good way of informing students of the work activities and settings of science. Students must receive information on job opportunities and prerequisite training in time to influence relevant education and career decisions.

Another important aspect of the college experience is the psychological support structure. Several suggestions were made for ways of maintaining high morale and creating an environment that makes it easy for the student to recognize and acknowledge his/her needs and to seek and accept help in academic and social matters. Interaction with role models, availability of personal counseling, the presence of mentors (e.g. science professionals, faculty, community people or advanced students), and the existence of formalized peer groups, such as student chapters of minority scientific societies and pre-professional

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*Comment from a survey respondent.

discipline-based clubs, were identified as elements that facilitate favorable psychological adjustment to college life. Respondents felt that the availability of various types of assistance for identifying behavioral models, managing social life, satisfying spiritual needs, resolving internal and interpersonal conflicts and maintaining a realistic perspective would increase the chances of academic success in college. Some respondents stressed the value of peer relationships; others referred to the role of counselors and others urged use of appropriate role models. Some emphasized the importance of group activities, cohesiveness and support, while others expressed the need for one-to-one or individual support structures. This diversity of perspectives among the scientists in this survey parallels the diversity in the population of minority students who will undoubtedly have differing preferences, styles and needs for support. While all of these needs exist for students other than minority women, the problems are compounded for minority women by the social isolation which results from being different.

Two suggestions were made that relate indirectly to the student. One respondent suggested that programs be initiated to increase faculty awareness of the problems and potential of minority students. Another scientist mentioned the need for research on the reasons for attrition and field-switching among minority students, with particular attention to differences in retention rates and patterns among fields.

Graduate Training

This survey asked "what should be done to increase the number of minority students entering and completing graduate degree programs in science and mathematics?" Twenty-three of the respondents said that availability of financial aid - fellowships, grants, loans - was the most important factor in promoting graduate training for minority students.

Several suggestions in response to this question focus on the student as an undergraduate. Some respondents said that better undergraduate training and a less stressful experience during those years would increase the likelihood of a student's pursuing and completing graduate work. Membership in undergraduate honor societies was identified as another factor that contributes to the chances for success. One respondent suggested that information about graduate departments which are particularly receptive to and supportive of minority students be collected and disseminated to undergraduate students. Another proposed tabulating the numbers of graduates of each department by gender and race and distributing these data to students so that they can draw their own conclusions. Similarly, an orientation to graduate school was proposed as a means of clarifying expectations and requirements in advance of admission.

Some recommendations have to do with policies of the academic institutions. Several scientists suggested changes in recruitment policies and practices toward a more aggressive effort to identify and enroll minority students, particularly those with interest in and potential for science and mathematics. One person suggested a lowering of academic requirements for admission. While this strategy is controversial, there is the argument that it is the end product - the graduate - that counts. Thus, it makes no difference what level of achievement or preparedness the student brings to the institution, so long as the institution equips him/her with the tools and knowledge necessary for success before graduation. This theory does not sanction the "revolving door" phenomenon exhibited by many institutions that admit acceptable numbers of minority students with relaxed admission standards, but demonstrate no commitment to educate them or retain them through completion of a standard academic program. It is rather the model of many traditionally Black institutions which have admitted students despite academic deficiencies and provided whatever educational programs and services were needed to bring those students to the exit requirements designated for the degree.

In contrast to this idea, another scientist suggested better pre-admission assessment and consideration of the students' potential to succeed in graduate school. This approach would reduce the number of "failures" by eliminating the "high risk" applicants. If the pre-admission assessment were accurate, however, the number of minority admissions could change in either direction and the number of graduates would be as high or higher than with existing policies. Some students who would have been rejected with present standards might be accepted with more accurate measures of potential. Those students who would have been accepted but doomed to failure would, with more accurate assessment, be screened out.

An interesting difference in these two approaches to admission policy is that one presumes that the institution has no responsibility to accommodate the student and can legitimately accept only those students who fit a specified mold. The other approach requires the university to tailor its programs and services to diverse student needs in the course of pursuing the same goal - that of training and graduating people with a specified body of knowledge and range of skills.

One respondent suggested greater flexibility in the time allowed for completion of degree requirements. This provision was offered as a means of facilitating employment in jobs related to the course of study which might enhance training and lessen the financial burden of full-time, continuous graduate study.

The single recommendation specifically related to the curriculum was the inclusion of internship or co-op programs. The need for actual work experience related to the course of study, with or without salary, was suggested by several respondents. One scientist proposed an initial year of work prior to the start of employer-sponsored graduate study, with the commitment to resume employment during summers and after graduation. Others stressed the importance of the opportunity to earn money at jobs which are relevant to the training of a scientist.

A related suggestion was that the availability of jobs be better publicized - jobs which might be available to graduates of the degree program, as well as those for which graduate students would qualify.

Several respondents identified roles for minority and women scientists and their professional associations. A mentor program was proposed. Mentor relationships usually develop spontaneously when dedicated professors identify promising students and provide them continuing advice, information and/or assistance in attaining their career goals. Though such relationships are difficult to create, there are model programs that have brought professionals and students in contact with one another with this objective in mind. Scholarly conferences and tutorial programs were suggested activities for the associations. Increased use of minority and women scientists as role models in the media was urged by some who expressed the need for motivating, encouraging and providing suitable models for minority students at every level. Improved counseling services and activities to promote acceptance by peers were also suggested. The difficulty in establishing mutually supportive collegial relationships with majority graduate students inhibits the progress of many minority women students.

The issue of field-switching was raised in a different context. Although a significant portion of minority students initially majoring in science, engineering or mathematics eventually change their majors to non-science fields, frequently to education, there is much less field-switching in the reverse direction. That is, very few students switch from English, for example, to chemistry as a major. Change from one science field to another is not especially common, although the early course requirements would make this transition feasible in many instances. One respondent suggested that field-switching between science and engineering fields and into these fields from other disciplines be facilitated, for example, by providing advice on alternative majors within the science and technical fields and offering a broad range of science and mathematics courses in the core curricula.

The quality and strength of the placement and career counseling services were considered important. Access to informal placement networks and advice and information about the job search and grant application processes are particularly important to minority students,

since their resources away from the institution are likely to be limited.

A policy recognizing the value of the presence of minority faculty was recommended. Their importance as role models, mentors and effective advisors for minority students, and their significance as a symbol of the institutions' commitment can only enhance their value as educators and scientists.

Although most (possibly all) responses seem to have presumed graduate study at a majority institution, there was one recommendation with regard to minority universities and colleges. In order to insure the presence of outstanding minority scientists on faculty at minority institutions, the endowment of chairs within science departments was suggested.

## The Minority Woman Scientist in the Workplace

### A. The Problems

The survey asked what the most important problems were for minority women employed in science and mathematics-related fields and what might be done to alleviate those problems.

There are essentially four aspects of the problems identified by survey respondents: (1) society's view of the minority woman scientist; (2) the employer's attitude and behavior toward the minority woman employee; (3) the attitudes and behavior of co-workers and colleagues in the workplace and in other professional settings; and (4) the minority woman's perception of self, attitude toward others and behavior.

In replies to this question, the focus shifted subtly from "minority" to "women", as more of the problems were viewed as gender-based. This is consistent with views expressed in The Double Bind: The Price of Being a Minority Woman in Science of the early effect of racism and later effects of sexism as barriers facing minority women.

Society's view of the women was reported by them as being characterized by disapproval, resentment and failure to accommodate needs peculiar to women in demanding non-traditional occupations. The respondents perceived a persistent attitude that their choice of occupation was inappropriate and unacceptable to the society or immediate community. The notion that minority women enjoy special privileges and advantages due to affirmative action is a source of resentment that survey respondents considered unjustified. The employment and salary statistics do not give evidence of preferential

treatment of minority women. On the contrary, there is considerable evidence of persisting discrimination; for example, minority women receive lower average salaries than minority males or majority males and females. Further, this misconception promotes the view that minority women are essentially non-performers who do not merit the status they have attained. The reluctance of society to respond adequately to the increasing demand for necessary services (such as child care), is seen as a problem particularly for women who have children, and to a lesser extent for those who are married without children. The husbands of women scientists typically have demanding careers; the difficulty of providing the best circumstances for both careers simultaneously, while managing household and personal responsibilities is felt most acutely by the women.

The attitude of employers is the problem area with the most significant tangible effects. The consequences of prejudice and discrimination by employers are quite serious and have far-reaching impact on other relationships and facets of the individual's career and personal life. The participants in this survey saw the negative aspects of the employer-employee relationship as resulting from a failure of the employer to recognize the potential, competence and actual accomplishments of minority women. The results of this failure are seen in many ways: (1) lower pay than that given men or majority women for the same or comparable work; (2) slower advancement for minority women than for their colleagues - denial of promotions, placement in dead-end jobs, failure to acknowledge significant work for which another would have been rewarded, and denial of opportunities to demonstrate competence at responsible tasks; (3) underutilization - relegation to tasks less demanding than qualifications or performance would suggest; (4) assignment to an excessive number of committees and ancillary activities as a "token" whose perspective is not genuinely appreciated, or whose contribution is expected to be disproportionately large; (5) fewer rewards and less recognition for achievement than would be afforded others for comparable work; and (6) less job security, for example, assignment to temporary or non-tenured positions.

The attitudes of and relations with co-workers and colleagues during professional activities, such as scientific meetings, is another area fraught with problems. The obstacles in this area are, however, much harder to identify or redress. The basic problem is that co-workers harbor some of the same prejudices and resentment held by the larger society. The view that minority women are innately inferior intellectually, that they "don't belong" in the role of scientist, and that they pose a threat rather than an opportunity for positive change is seen as a basis for a number of negative behavioral traits and patterns exhibited by co-workers of minority women scientists. The tendency to ignore minority women when considering persons for collaboration, training or job opportunities or for quasi-social functions which enhance professional life is a problem. Also mentioned

was the presence of sexual harrassment and a general lack of respect and regard for minority women as professionals of equal stature.

The most frequently mentioned manifestation of negative feelings is isolation of minority women. Exclusion from informal professional activity; denial of empathetic support; reluctance to assist in a collegial way; refusal to acknowledge accomplishments or competence; denial of mentorship; exclusion from informal communication and support networks; and in general, lack of recognition as a legitimate and valuable part of the peer group are the kinds of problems mentioned. The small numbers of minority women scientists and the pattern of their geographic distribution make it rare that a large number of such women live or work in close enough proximity to each other to compensate for the lack of mutual support in most peer groups.

The relationship between the employment environment and the minority woman scientist - her attitudes and behavior - often becomes circular. The minority woman's self-esteem and anxiety levels are necessarily affected by the other factors, and her behavior can, theoretically, influence the way others respond to her. The characteristic specifically attributed to minority women scientists by survey respondents was the perpetual drive to prove one's competency, to remove all doubt that others may have about one's fitness, capability and performance. This often results in the minority woman's pushing herself to do more and be better than her colleagues, and, where other personal responsibilities compete, to approach them with a similar desire to excel. The other problem area identified was the difficulty in fulfilling the multiple roles of scientist and wife and/or mother.

B. The Solutions

Participants in this survey were asked to propose solutions to the problems they identified. The solutions offered necessitate some change in either the women or their work environments. Respondents proposed several ways for the science establishment to accommodate and facilitate the entry of minority women into the mainstream of science. Throughout the solutions, there are functions to be undertaken by employers, government, other organizations, including AAAS, and the women themselves.

Survey respondents mentioned three things which the minority women might do for themselves: (1) be willing to compete with men in the amount of effort and time invested in their career; (2) participate in professional activities such as national meetings; and (3) organize support groups with other minority women in the workplace. One respondent cautioned that minority women not be too disappointed if the results of such efforts do not reach their expectations since many other factors may influence the outcome.

Several recommendations were made for employer action. Six respondents urged increased training, hiring and promotion of minority women through affirmative action and fair employment practices. The importance of "increasing the numbers" in a workplace as a way of improving working conditions was expressed strongly in response to this and other questions. Some felt that employers should make a strong effort to dissociate race and gender from considerations of merit and performance.

One respondent suggested that employers initiate programs for all employees to help identify and combat racism and sexism in the workplace. Another suggested activities to make supervisors aware of their own attitudes toward and treatment of minority women.

The suggestion was made that employers provide support services for specific needs of minority women, by such means as facilitating development of mentor relationships. The availability of part-time professional job opportunities and leaves of absence were seen as provisions which would specifically help some minority women accommodate multiple roles and responsibilities. Fuller utilization of minority women in the work force, equitable pay and promotion and other means of correcting inequities described in the "Problem" section were recommended.

From the government, the survey respondents would like better enforcement of laws and regulations that promote equal opportunity, and greater access to grants and support for research. They urged a better flow of information and assistance in starting research careers.

The development of quality child care facilities and increased advocacy and action by the government and the private sector in meeting this need was urged.

Survey respondents identified specific areas in which organizations such as AAAS could be useful. They asked for (1) assistance in obtaining research grants that would give them the opportunity to demonstrate ability to manage and conduct research, such as through education programs on proposal writing and review processes; and help in gaining access to sources of information about grant availability; (2) publication of data on effects of racism and sexism in science, including salary disparities; (3) study of employer practices and policies with particular attention to their effect on minority women; (4) identification of other minority women scientists and formation of networks and groups to provide the communication and peer support that are so important in the advancement of careers in the sciences; and (5) advocacy on behalf of minority women in science to federal policymakers, national organizations and the public.

## The Impact of Race and Gender on Employment Status and Salary

There were varying perceptions of the influence of the minority woman's race or ethnicity and gender on employment status and/or salary. Four people felt it had been easier to get hired, particularly for the first professional job, because they were minority females, but noted that the advantage disappeared quickly after hiring. There was a strong feeling that their salaries were lower than those of their colleagues, with occasional mention of a positive change as a result of federal intervention. The next most frequently mentioned matter was that of slower advancement and less recognition for work of value comparable to that for which male colleagues are typically well rewarded. Contrary to the experience of most respondents, one woman felt her career progress had been accelerated because of her race and/or gender. Several felt that women must work significantly harder than men for comparable professional status and pay. One respondent said that the fact that the merit of her promotions is always questioned or even doubted by colleagues creates additional stress and a tendency to be defensive.

One respondent said she got more attention in general because she was a minority woman - different in that respect from her peers.

The lack of encouragement to pursue advanced training in science reported by many minority women carries over into the workplace, as described by one respondent. "I am encouraged to pursue employment and salaries which are less than my education or professional experience qualify me for."

While three respondents reported that being a minority woman had not affected their status or salary, most felt that there had been some negative effects.

## Effects of Marriage and/or Children

The issues raised regarding marriage and parenting elicited very strong feelings from the scientists regardless of their personal circumstances. There was agreement that being married and having children have an effect on the minority woman's career and professional life. Whether this effect was considered negative, neutral or positive, the degree of perceived influence varied widely depending on the personal circumstances, values and priorities of the respondent. As one woman wrote, "Every important decision I've made and will make impinges on the life of both child and husband and therefore their wishes or needs must be considered."

The aspects of professional life identified as being most seriously affected by marriage and parenting were: (1) amount of time available for work; (2) mobility - travel related to a particular job or other professional activities as well as relocation for better career opportunities; (3) participation in professional activities outside regular working hours - number of invitations and opportunities and availability to participate; and (4) compensation for absence from professional activity, such as during childbirth/childrearing leaves.

Several single women (some formerly married) felt that pursuit of their career objectives was incompatible with marriage and to a greater extent with parenting. Most negative views with regard to marriage reflected low expectations as to the willingness or ability of men to assume a role supportive of the woman's career development. Comments that "being single has allowed me to devote all the time I desire to a [career]..." and by another woman, that she would not have been able to acquire the advanced degree and compete with males on the job if she had had the additional responsibilities of marriage and children were typical. A few respondents indicated that in the early stages of their careers, they preferred to have no competing responsibilities, but that after they become established professionally, they would like to marry and have children.

It was generally felt that married women scientists, especially those with children, have less time to devote to career interests than do their single colleagues. There was also agreement that the need to consider the preferences and needs of others (spouse or children) made it less likely that decisions regarding travel or relocation for career would be made strictly on their own merit. Consequently, some such decisions would not be in the best interest of the career. Some respondents felt that single women were more likely to be asked to participate in evening and weekend events - professional meetings, social functions with colleagues and activities generally seen as beneficial to career development; to accept assignments requiring travel; and to assume major responsibilities that entail long hours. Even if married and single women were given the same opportunities in these areas, the perception of most respondents is that married women, especially those with children, would be less available (willing or able) to accept them. The difficulty in retaining job security during absences necessitated by childbirth, and the difficulties associated with reentry after extended absence from professional life were problems reported as associated with parenting.

Although most of the effects of marriage and parenting on career are, from a subjective standpoint, negative, most married women--those with and without children--considered their decision to combine career and family a highly rewarding one. Their perspective on their lives was a broad one, which in many instances gave equal priority to family life. One married woman with no children wrote, "Marriage has influenced me to

choose one job over an otherwise more attractive one, but in the long run of my career, I think marriage or children will have small effect on the quality and direction of my work." The subjective view of marriage and family is best presented by the women themselves. Several quotes demonstrate the perspectives of married women on this issue: "...happiness in being married far outweighs the restrictions...[which have been considerable]." "The effect has no doubt been on my marriage and child rather than on my career." "My children have limited the amount of time I have to spend studying and with my research, but they have also given me love and encouragement and the support I need to continue." "My career options have been, and are limited, due to the fact that my family has chosen to remain together. On the other hand, we wouldn't have it any other way. We support each other in science, career and many other areas." "Being married has enhanced my professional life through much needed support by my husband when dealing with obviously discriminatory situations..." "A supportive husband and one or two children are a great benefit and stabilizing force, once the children are in school." "Marriage and children have added to my enjoyment, fulfillment and problems."

In summary, the differences in the lives of married and single minority women depend largely on the personal options, preferences and priorities of the individual. Contrary to the pervasive view that marriage and family may detract from professional life, research on the achievement, status and productivity of women scientists shows married women with or without children to be more productive than single women. Helen Astin* concluded, based on her research findings, that one could not attribute the lower status of academic women to the constraints of marriage and family life. Jonathan Cole** noted from his research that "not only do marriage and daily life fail to impede scientific productivity of women, but they seem to be related to small increases in research performances." While the objective factors are clear, the perceptions of those factors as significant, harmful or desirable vary as do the personalities of the persons involved.

It is not possible to know whether a given woman would have been a more successful scientist with or without spouse and/or children. We know too little about the complex factors which influence the development of talents and abilities and their relation to the personal circumstances which facilitate or inhibit achievement. Since most of the relevant factors cannot be manipulated as variables in a scientific

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*Research by Helen S. Astin presented in Women: A Challenge to Higher Education, Helen S. Astin and Werner Hirsch editors, Praeger Press, New York.

**Jonathan R. Cole, "Women in Science, American Scientist 67:4 (1981).

experiment, the question is moot. For those women who are sacrificing some aspect of their lives for the perceived benefit to another aspect, there is evidence, however, that successful marriage, parenting and employment as a scientist are not mutually exclusive or conflicting conditions.

May it suffice to say that there are successful models of minority women scientists in a full range of personal circumstances. The degree to which all alternatives are attainable for most minority women will depend on the response of society to the needs of minority women scientists and the access of future scientists to the successful role models.

## Issues Which Merit National Attention

This survey invited respondents to identify important issues and areas where research is needed to which they would like to draw national attention. Less than one fourth of the issues mentioned have a direct bearing on the lives of the scientists as minority women. Most suggestions have to do with the well-being of our society and the quality of life and opportunity for young people, especially minorities and women.

The issues which have to do with their own lives were (1) realization by society of the capability of minority women to be serious, career-oriented professional scientists; (2) the opportunity for career growth and truly equal access to jobs at all levels; (3) the need for better understanding by minority women of the grant funding process; (4) the availability of flexible hours and part-time professional work opportunities; (5) availability of quality child care services, and the realization of the potential benefit to society if there were more options for families with children; and (6) more attention - research and intervention - to address the conflict between career (for women) and family.

There were several research questions having to do with minorities and/or women. Each research question underlies an area of concern in which the respondents perceived that there is hope for change. In some instances, the "change" is merely increased public awareness of an issue or fact, or greater understanding of a problem by some particular group. The suggested research topics were (1) the strong and positive characteristics of minority racial/ethnic groups in contrast to the negative stereotypes which prevail; (2) effective methods of getting minority students in grades five through eight to elect and study mathematics with enthusiasm; (3) the reasons relatively few women obtain advanced science education and training; (3) the reasons women work, the economic necessity and the choice of career vs. job; (4) the changes in family relationships, lifestyles, and societal

values related to women's increasing participation in demanding, traditionally male careers; and (5) success mechanisms of minority women scientists.

Other areas of attention were identified for specific action. Several individuals urged the increased entry of minorities in the environmental sciences, natural resources, mathematics, computer science, engineering or the physical sciences and expressed concern that there are too few minority students at the various stages on the path to science careers. Survey respondents stressed the importance of improving science education and understanding of science among minority students. They mentioned the role of counseling and career guidance in determining course election and career choice.

The participants in this survey are women; most are members of minority groups; some are wives; some are mothers; but they all are scientists. And the results of this survey reveal their very strong commitment to promoting the use of science and technology for the common good. The list of issues which the respondents felt deserved national attention is long and reflects their diverse training and interests. Environmental pollution - preservation of clean air and water, and conservation of natural resources topped the list of concerns. Respondents urged increased support of research and development, particularly basic research. The need for more research and development of alternative sources of energy was mentioned. Manipulation of genetic material, infertility and safe disposal of radioactive wastes were other issues of concern. One survey participant urged attention to the current move to award the high school diploma based on performance on a test, with students who fail the test finishing high school with a certificate of little value. Another respondent mentioned the need for better access to information about employment fields where substantial growth is expected and salaries are high, and about geographic areas with good employment opportunities. There was concern about the decline of science literacy and public understanding of science. One scientist decried the "increasing use and societal acceptance of drugs - legal and illegal - that lend themselves to abuse." Finally, the concern was raised that data generated from research are often not heeded, with decisions, including choice of research topics, being made on the basis of political interests.

The point to remember about the participants in this survey is that although they may have become scientists after a unique and nontraditional (for scientists) set of experiences, they ultimately are more like than different from other scientists. Their view of the world is not so different from that of other men and women similarly trained in these fields.

## SUMMARY AND CONCLUSIONS

The results of this survey suggest three major educational objectives:

(1) to provide all students with the most rigorous mathematics and science education possible;

(2) to give students the information necessary to make wise decisions regarding education and career; and

(3) to motivate students to persist in efforts that are necessary for them to reach their intellectual potentials.

There is no illusion among minority women scientists that all minority students - male or female - are suited for careers in mathematics and science. There is simply the concern that these fields be included among the career options of all students.

The strategies for attaining these objectives call for changes in the prevailing attitudes of students, teachers and counselors, especially with regard to racial and gender stereotypes and student potential. The scientists urged several changes, among these (1) better access of students and faculty to career information; (2) increased student interaction with appropriate role models; (3) increased emphasis on the development of self-discipline; (4) increased participation by students in out-of-school activities which enrich science learning; (5) earlier introduction to science and mathematics in the schools; (6) greater emphasis on "hands-on" science; (7) increased use of scientists, particularly minority men and women, as speakers; (8) use of science curriculum materials which are relevant to the students' experience; (9) support of supplementary academic programs; (10) improved career guidance and counseling; (11) more opportunities for college students to have work related to the course of study; (12) increased opportunity for student participation in research; and (13) availability of appropriate academic and personal support services. Of particular importance for graduate training is the availability of financial assistance. This survey revealed a strong feeling that the financial pressures that result from debts incurred during undergraduate study, coupled with family responsibilities of many graduate students, make it difficult to undertake full-time graduate study.

Although most strategies and solutions are directly aimed at students, three suggestions focussed on others: (1) to recruit more women and minorities to the teaching of science; (2) to sensitize

faculty to the particular problems of minority students at majority institutions; and (3) to increase faculty awareness of the potential of minority students.

There were policy recommendations designed to increase the number of minority students receiving graduate degrees and to facilitate the smooth transition from school to the world of work. The coordination of admission policies with retention efforts, increased opportunity for work related to the field of study, better assistance in learning the "professional ropes" and finding that first postgraduate position were some of the suggestions made.

The issue of equal opportunity in employment and professional life drew attention to some of the most subtle and intractable problems faced by minority women. Exclusion from the important informal interactions, seldom discussed or officially recognized as significant to career advancement, is a major deterrent to the progress of minority women scientists. The tangible disparities in salary, promotion rate, level of responsibility and job security are largely influenced by the informal collegial relationships in which minority women are seldom included. Their relegation to less desirable or less challenging assignments or less responsible positions limits their potential for advancement. Finally, the issue of family responsibilities and the inadequacy of available child care services was raised. The failure of society and employers in particular to either provide suitable child care services or allow flexible work schedules to accommodate the demands of parenting, creates a persisting problem for many women scientists.

The respondents to this survey urged employers to take the initiative in exposing and eliminating overt and covert discrimination in the workplace. They urged continued vigilance and intervention when necessary by federal and state governments to ensure that individuals are not discriminated against because of their race, ethnicity or gender. The minority women scientists have identified needs which can be addressed by various kinds of organizations and institutions, including advocacy for the issues discussed and for equity in general, information gathering and dissemination, technical assistance in obtaining funds for research, and establishment of a communication network so that minority women can provide mutual support and assistance to one another as scientists and students.

Finally, the expressions of concern about broader issues and societal problems suggest the need to recognize and utilize minority women for their scientific knowledge and expertise in a wider range of settings. We have a responsibility to understand the significance of the personal values, experiences and interests of the scientist in the conduct of science. These factors influence every aspect of scientific activity including the selection of research questions, the formulation

of hypotheses, the analysis of data, and the setting of program and funding priorities. It is possible that the closest we shall ever come to objectivity in science will be when we achieve a totally diverse population of scientists. Improving the access of minority women to the training and professional opportunities in science is a step toward strengthening the health of the scientific enterprise. This paper has hopefully offered some insight into the means by which the scientists themselves feel that this goal can be attained.

# APPENDIX A

NATIONAL NETWORK OF MINORITY WOMEN IN SCIENCE

Member Information

Name_____

Address_____

City_____ State_____ Zip_____

Summer address (if different) _____

_____

Place of Employment_____

Daytime phone (include area code)_____

Background Information:

Degrees, Institutions, Dates: _____

_____

_____

_____

Research or Business Interest:_____

_____

Professional Organizations: _____

_____

_____

Racial/Ethnic Identification _____

Membership Category

___ General (Asian American, American Indian, Black, Mexican American, or Puerto Rican women at any level of training for or employment in a science or engineering occupation)

___ Associate (Minority women, not trained or employed in science or engineering; minority men or non-minority women who support the objectives of the Network and wish to participate in its efforts)

___ Affiliate (any individual or organization that supports the objectives and activities of the Network)

(over)

The most important benefit I seek from the Network is

I have time and/or facilities to:

____ 1. make phone calls to other members

____ 2. host a local meeting at my home or office

____ 3. make contact with prospective funding sources

____ 4. prepare memos to disseminate timely job or fellowship information to other members

____ 5. identify other minority women in science

____ 6. serve as a role model for career workshop or school programs

____ 7. (other)_____

The following kinds of information would be most useful to me:

The American Association for the Advancement of Science has permission to recommend me for the following scientific activities:

_____review committees

_____conference or symposium speaker

_____jobs

_____advisory committees or boards

to include my name on a mailing list released for

_____ grant program information
_____ purposes other than commercial solicitation or fundraising

_____employment information
_____specific searches for minority women scientists to publicize educational or research activities

PLEASE COMPLETE AND RETURN TO:

Paula Quick Hall
Office of Opportunities in Science
American Assocaition for the Advancement of Science
1776 Massachusetts Avenue, NW
Washington, DC 20036
(phone (202) 467-5431)

980

# APPENDIX B

Note: The term "unspecified" in the tables signifies a gap in the information provided by MWIS members.

TABLE I. STATISTICAL PORTRAYAL OF NATIONAL NETWORK OF MINORITY WOMEN IN SCIENCE BY RACE, DISCIPLINE AND DEGREE LEVEL

| | BLACK | ASIAN | MEXICAN AMERICAN | NATIVE AMERICAN | PUERTO RICAN | NON-MINORITY | OTHER | UNSPECIFIED | TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| **MATHEMATICS** | | | | | | | | | |
| Bachelor | | | | | | | | | 0 |
| Master | 1 | | | | 1 | | | | 2 |
| Ph.D. | 5 | 2 | | | | | | 1 | 2 |
| **ASTRONOMY** | | | | | | | | | |
| Bachelor | | | | 1 | | | | | 1 |
| Master | | | | | | | | | 0 |
| Ph.D. | | | | | | | | | 0 |
| **PHYSICS** | | | | | | | | | |
| Bachelor | | | | | | | | | 0 |
| Master | 1 | | | | 1 | | | | 2 |
| Ph.D. | 3 | 3 | 1 | | | | | | 7 |
| **CHEMISTRY** | | | | | | | | | |
| Bachelor | 2 | | | | | 1 | | | 3 |
| Master | 3 | 1 | 1 | | | | | | 5 |
| Ph.D. | 7 | 1 | | | 1 | 1 | | 2 | 12 |
| **EARTH SCIENCES** | | | | | | | | | |
| Bachelor | 1 | | | | | | | | 1 |
| Master | 2 | | | | | | | | 2 |
| Ph.D. | 2 | | | | | | | | 2 |
| Other | 1 | | | 1 | | | | | 2 |
| **ENGINEERING** | | | | | | | | | |
| Bachelor | 3 | | | | | | | | 3 |
| Master | 1 | | | | | | | | 1 |
| Ph.D. | 2 | | | | | 1 | | | 3 |
| Other | 1 | 1 | | | | | | | 2 |
| **ENVIRONMENTAL SCIENCES** | | | | | | | | | |
| Bachelor | 1 | | | | | | | | 1 |
| Master | 1 | | | | | 1 | | | 2 |
| Ph.D. | 1 | | | | | | | | 1 |
| Other | 1 | | | | | | | | 1 |
| **MEDICAL SCIENCES** | | | | | | | | | |
| Bachelor | | | | | | | | | 0 |
| Master | 5 | 1 | | | | 1 | | 1 | 8 |
| Ph.D. | 8 | 2 | | | | 1 | | 4 | 15 |
| Other | 1 | | | | | | | | 1 |
| Unspecified | | | | | | 1 | | | 1 |

Source: Compiled by Rachel Warner from National Network of Minority Women membership data.

TABLE I. STATISTICAL PORTRAYAL OF NATIONAL NETWORK OF MINORITY WOMEN IN SCIENCE BY RACE, DISCIPLINE AND DEGREE LEVEL (CONTINUED)

| | BLACK | ASIAN | MEXICAN AMERICAN | NATIVE AMERICAN | PUERTO RICAN | NON-MINORITY | OTHER MINORITY | UNSPECIFIED | TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| **BIOLOGICAL SCIENCES** | | | | | | | | | |
| Bachelor | 6 | | | | | 1 | | | 7 |
| Master | 7 | 1 | | | | | | 1 | 9 |
| Ph.D. | 43 | 10 | 6 | | 2 | 1 | 1 | 5 | 68 |
| Other | 3 | | | | | | | | 3 |
| Unspecified | | | | | | | | 1 | 1 |
| **PSYCHOLOGY** | | | | | | | | | |
| Bachelor | 2 | | | | | 1 | | | 3 |
| Master | | | | | | 1 | | | 1 |
| Ph.D. | 5 | 2 | | | 1 | | | 1 | 9 |
| Unspecified | 1 | | | | | | | | 1 |
| **SOCIAL SCIENCES** | | | | | | | | | |
| Bachelor | | | | | | | | | 0 |
| Master | 2 | | | | | | | | 2 |
| Ph.D. | 9 | 2 | | 1 | | 1 | | | 13 |
| Other | 1 | | | | | | | | 1 |
| **ARTS AND HUMANITIES** | | | | | | | | | |
| Bachelor | | | | | | | | | 0 |
| Master | | | | | | | | | 0 |
| Ph.D. | 1 | | | | | | | | 1 |
| **EDUCATION** | | | | | | | | | |
| Bachelor | 1 | 1 | | | | | | | 2 |
| Master | 3 | 1 | | 1 | 1 | | | | 6 |
| Ph.D. | 10 | | | | | | 1 | | 11 |
| **OTHER FIELDS** | | | | | | | | | |
| Bachelor | | | | 1 | | | | | 1 |
| Master | 3 | | | | | | | | 3 |
| Ph.D. | | | | | | | | | 0 |
| Other | 2 | | | | | | | | 2 |
| **UNSPECIFIED FIELD** | | | | | | | | | |
| Bachelor | | | | | | | | | 0 |
| Master | 1 | | | | | | | | 1 |
| Ph.D. | 4 | | | | | | | 7 | 11 |
| Unspecified | 7 | | | | | | | 25 | 32 |
| GRAND TOTAL | 164 | 28 | 8 | 5 | 7 | 12 | 2 | 48 | 274 |

Source: See first page of Table I.

TABLE II. STATISTICAL PORTRAYAL OF NATIONAL NETWORK OF MINORITY WOMEN IN SCIENCE BY DISCIPLINE, STATE AND RACE

| | MATHEMATICS | ASTRONOMY | PHYSICS | CHEMISTRY | EARTH SCIENCES | ENGINEERING | ENVIRONMENTAL SCIENCES | MEDICAL SCIENCES | BIOLOGICAL SCIENCES | PSYCHOLOGY | SOCIAL SCIENCES | ARTS AND HUMANITIES | EDUCATION | OTHER FIELDS | UNSPECIFIED FIELD | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ALABAMA** | | | | | | | | | | | | | | | | |
| Black | | | | | | | | | 1 | | | | | | | 1 |
| Unspecified | | | | | | | | | | | | | | | 1 | 1 |
| **ARIZONA** | | | | | | | | | | | | | | | | |
| Black | | | | | | | | | | | 1 | | | | | 1 |
| Native American | | | | | | | | | | | | | | 1 | | 1 |
| **CALIFORNIA** | | | | | | | | | | | | | | | | |
| Asian | | | 1 | 1 | | | | 1 | 1 | | | | | | | 4 |
| Black | | | | | | | | 3 | 7 | | 1 | | 1 | | | 12 |
| Mexican American | | | | | | | | | 1 | | | | | | | 1 |
| Puerto Rican | | | | | | | | | 1 | | | | | | | 1 |
| Unspecified | | | | | | | | 1 | | 1 | | | | | | 2 |
| **COLORADO** | | | | | | | | | | | | | | | | |
| Native American | | | | | 1 | | | | 1 | | 1 | | | | | 3 |
| **CONNECTICUT** | | | | | | | | | | | | | | | | |
| Black | | | | | | | | | 1 | | | | | | | 1 |
| **DISTRICT OF COLUMBIA** | | | | | | | | | | | | | | | | |
| Asian | | | | | | | | | | | 2 | | | | | 2 |
| Black | | | 2 | 4 | 1 | 1 | 1 | 5 | 11 | 2 | 3 | | 2 | 1 | 2 | 35 |
| Mexican American | | | | | | | | | 1 | | | | | | | 1 |
| Unspecified | | | | | | | | 1 | 2 | | | | | | 15 | 18 |
| **FLORIDA** | | | | | | | | | | | | | | | | |
| Asian | | | | | | | | | 1 | | | | | | | 1 |
| **GEORGIA** | | | | | | | | | | | | | | | | |
| Black | 3 | | | 1 | 1 | | | 1 | 8 | | | | 2 | | 1 | 17 |
| Mexican American | | | | | | | | | 1 | | | | | | | 1 |
| **HAWAII** | | | | | | | | | | | | | | | | |
| Asian | | | | | | | | | 1 | | | | | | | 1 |
| **ILLINOIS** | | | | | | | | | | | | | | | | |
| Black | | | | | | 1 | 1 | 1 | | | | | | | | 3 |
| Unspecified | | | | | | | | | | | | | | | 1 | 1 |
| **INDIANA** | | | | | | | | | | | | | | | | |
| Non-minority | | | | | | | | | | 1 | | | | | | 1 |

Source: Compiled by Rachel Warner from National Network of Minority Women in Science membership data.

TABLE II. STATISTICAL PORTRAYAL OF NATIONAL NETWORK OF MINORITY WOMEN IN SCIENCE BY DISCIPLINE, STATE AND RACE (CONTINUED)

| | MATHEMATICS | ASTRONOMY | PHYSICS | CHEMISTRY | EARTH SCIENCES | ENGINEERING | ENVIRONMENTAL SCIENCES | MEDICAL SCIENCES | BIOLOGICAL SCIENCES | PSYCHOLOGY | SOCIAL SCIENCES | ARTS AND HUMANITIES | EDUCATION | OTHER FIELDS | UNSPECIFIED FIELD | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **KANSAS** | | | | | | | | | | | | | | | | |
| Non-minority | | | | | | | | | 1 | | | | | | | 1 |
| **KENTUCKY** | | | | | | | | | | | | | | | | |
| Black | | | | | | | | | 1 | | | | | | | 1 |
| **LOUISIANA** | | | | | | | | | | | | | | | | |
| Black | | | | | | | | | 2 | | | | | | | 2 |
| Puerto Rican | | | | | | | | | 1 | | | | | | | 1 |
| Unspecified | | | | | | | | | | | | | | | 1 | 1 |
| **MARYLAND** | | | | | | | | | | | | | | | | |
| Asian | | 1 | | | | | | | | 1 | | | | | | 2 |
| Black | | | 1 | | 2 | | | 3 | 5 | 1 | 1 | | 3 | | 3 | 19 |
| Puerto Rican | 1 | | | | | | | | | | | | | | | 1 |
| Non-minority | | | 1 | | | | | | | | 1 | | | | | 2 |
| Other minority | | | | | | | | | 1 | | | | 1 | | | 2 |
| Unspecified | | | | | | | | 1 | | | | | | | 11 | 12 |
| **MASSACHUSETTS** | | | | | | | | | | | | | | | | |
| Asian | | | | | | | | 1 | 2 | | | | | | | 3 |
| Black | | | | | | | | | 3 | | 2 | | 1 | | 3 | 9 |
| Mexican American | | | | | | | | | 1 | | | | | | | 1 |
| Native American | | | | | | | | | 1 | | | | 1 | | | 2 |
| Unspecified | | | 1 | | | | | | | | | | | | 1 | 2 |
| **MICHIGAN** | | | | | | | | | | | | | | | | |
| Black | | | | | | | 1 | 1 | | 1 | 2 | | 1 | | | 6 |
| Non-minority | | | | | | | 1 | | | 1 | | | | | | 2 |
| **MINNESOTA** | | | | | | | | | | | | | | | | |
| Black | | | 1 | | | | | | | | | | | | | 1 |
| **MISSISSIPPI** | | | | | | | | | | | | | | | | |
| Black | | | | | | | | | | 1 | | | 1 | | | 2 |
| Non-minority | | | | | 1 | | | | | | | | | | | 1 |
| **MISSOURI** | | | | | | | | | | | | | | | | |
| Black | | | | | | | | | 1 | 1 | | | | 1 | | 3 |
| **NEW JERSEY** | | | | | | | | | | | | | | | | |
| Asian | 1 | | 1 | | | | | | | | | | | | | 2 |
| Black | | | 1 | 2 | 2 | | | | | | | | | | | 8 |
| Puerto Rican | | | | 1 | | | | | 1 | | | | 1 | 1 | | 1 |

Source: See first page of Table II.

TABLE II. STATISTICAL PORTRAYAL OF NATIONAL NETWORK OF MINORITY WOMEN IN SCIENCE
BY DISCIPLINE, STATE AND RACE (CONTINUED)

| | MATHE-MATICS | ASTRON-OMY | PHYSICS | CHEMIS-TRY | EARTH SCIENCE | ENGIN-EERING | ENVIRON-MENTAL SCIENCES | MEDICAL SCIENCES | BIOLOGI-CAL SCIENCES | PSYCHOL-OGY | SOCIAL SCIENCES | ARTS AND HUMANI-TIES | EDUCA-TION | OTHER FIELDS | UNSPEC-IFIED FIELD | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **NEW MEXICO** | | | | | | | | | | | | | | | | |
| Black | | | | 1 | | | | | | | | | | | | 1 |
| Mexican American | | | | 1 | | | | | | | | | | | | 1 |
| Unspecified | | | | | | | | 1 | | | | | | | | 1 |
| **NEW YORK** | | | | | | | | | | | | | | | | |
| Asian | | | | 1 | | | | | 1 | | | | | | | 2 |
| Black | | | 1 | 1 | | | 1 | | 2 | 1 | 1 | | | 1 | | 8 |
| Puerto Rican | | | 1 | | | | | | | | | | 1 | | | 2 |
| Non-minority | | | | 1 | | | 1 | | | | | | | | | 2 |
| **NORTH CAROLINA** | | | | | | | | | | | | | | | | |
| Black | 1 | | | | | | | | 2 | | | | 1 | | | 4 |
| Unspecified | | | | | | | | | 1 | | | | | | | 1 |
| **OHIO** | | | | | | | | | | | | | | | | |
| Asian | | | | | | | | | 1 | | | | | | | 1 |
| **OREGON** | | | | | | | | | | | | | | | | |
| Asian | | | | | | | | | 2 | | | | | | | 2 |
| Black | | | | | 1 | | | | | | | | | | | 1 |
| Mexican American | | | | | | | | | 1 | | | | | | | 1 |
| **PENNSYLVANIA** | | | | | | | | | | | | | | | | |
| Asian | | | | | | | | | 1 | | | | | | | 1 |
| Black | | | | | | | | | 1 | | | | | | | 1 |
| Puerto Rican | | | | | | | | | | 1 | | | | | | 1 |
| Non-minority | | | | | | | | 1 | | | | | | | | 1 |
| Unspecified | | | | 1 | | | | | | | | | | | 1 | 2 |
| **SOUTH CAROLINA** | | | | | | | | | | | | | | | | |
| Asian | | | | | | 1 | | | 1 | | | | | | | 2 |
| Black | | | | | | | | | 1 | | | | | | | 1 |
| **TENNESSEE** | | | | | | | | | | | | | | | | |
| Asian | 1 | | | | | | | | | | | | | | | 1 |
| Black | | | | 1 | 1 | | | | 7 | 1 | | | 1 | 1 | 1 | 13 |
| Unspecified | | | | | | | | 1 | 2 | | | | | | | 3 |

Source: See first page of Table II.

TABLE II. STATISTICAL PORTRAYAL OF NATIONAL NETWORK OF MINORITY WOMEN IN SCIENCE BY DISCIPLINE, STATE AND RACE (CONTINUED)

| | MATHE-MATICS | ASTRON-OMY | PHYSICS | CHEMIS-TRY | EARTH SCIENCES | ENGIN-EERING | ENVIRON-MENTAL SCIENCES | MEDICAL SCIENCES | BIOLOGI-CAL SCIENCES | PSYCHOL-OGY | SOCIAL SCIENCES | ARTS AND HUMANI-TIES | EDUCA-TION | OTHER FIELDS | UNSPEC-IFIED FIELD | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TEXAS** | | | | | | | | | | | | | | | | |
| Asian | | | | | | | | | | 1 | | | 1 | | | 2 |
| Black | 1 | | | | | 1 | | | 1 | | | | | | | 3 |
| Mexican American | | | | | | | | | 1 | | | | | | | 1 |
| Non-minority | | | | | | | | | 1 | | | | | | | 1 |
| Unspecified | 1 | | | | | | | | | | | | | | 1 | 2 |
| **VIRGINIA** | | | | | | | | | | | | | | | | |
| Asian | | | | | | | | 1 | | | | | | | | 1 |
| Black | 1 | | | | | 1 | | | 3 | | 1 | | | | 2 | 8 |
| Non-minority | | | | | | | | 1 | | | | | | | | 1 |
| Unspecified | | | | | | | | | 1 | | | | | | | 1 |
| **WASHINGTON** | | | | | | | | | | | | | | | | |
| Asian | | | | | | | | | | | | | 1 | | | 1 |
| Native American | | 1 | | | | | | | | | | | | | | 1 |
| **WISCONSIN** | | | | | | | | | | | | | | | | |
| Black | | | | | | 1 | | | | | | 1 | | | | 2 |
| **MEXICO** | | | | | | | | | | | | | | | | |
| Mexican American | | | 1 | | | | | | | | | | | | | 1 |
| **SAUDI ARABIA** | | | | | | | | | | | | | | | | |
| Black | | | | | | | | | 1 | | | | | | | 1 |
| GRAND TOTAL | 10 | 1 | 9 | 20 | 7 | 9 | 5 | 25 | 88 | 14 | 16 | 1 | 19 | 6 | 44 | 274 |

Source: See first page of Table II.

# APPENDIX C

*American Association*
*for the Advancement of Science*

1776 MASSACHUSETTS AVENUE, NW, WASHINGTON, D. C., 20036

Phone: 467-4400 (Area Code 202) Cable Address: Advancesci, Washington, D. C.

September 16, 1980

Dear MWIS Member:

With the award of a grant from the Polaroid Corporation, for the purpose of expanding, the Office of Opportunities in Science is conducting a survey of members of the National Network of Minority Women in Science. We intend to prepare a short report for general distribution summarizing demographic features and issues of concern. This report will be useful in seeking support for the Network and its programs, and in raising public awareness of "who we are," "where we are," "what we do," and why we are so few. Copies of the report will be made available to MWIS members and the public on request, and will be sent (unsolicited) to individuals and groups in position to effect change and influence policy in areas of concern.

Your assistance in this effort is very important. Please complete the enclosed member information form (if you haven't done so within the past six months) and respond to the survey questions. We would like very much to receive your completed survey form and responses by October 15, 1980.

If you know of other minority women scientists or students who would like to join the Network and participate in this survey, please photocopy your form for them or ask them to write to Paula Quick Hall.

Sincerely,

Shirley M. Malcom
Program Head
Office of Opportunities
in Science

Paula Quick Hall
Program Associate
Office of Opportunities
in Science

SMM:PQH:rl
enclosures

SURVEY QUESTIONNAIRE

Please give a brief statement of your views on the following questions:

1. What should be done to change the fact that so few minority students take elective science and mathematics courses in high school?

2. What should be done to reduce attrition and field-switching among minority students initially majoring in science or mathematics in college?

3. What should be done to increase the number of minority students entering and completing graduate degree programs in science and mathematics?

4. (a.) What are the most important problems of minority women employed in science and mathematics-related fields? (b.) what actions by employers, government, and groups such as AAAS and MWIS could alleviate these problems.

5. What is the most important issue of concern, area of needed research or intervention, or prediction for the future to which you wish to draw national attention?

6. Do you feel that being married or not, and having children or not has made a difference in your career and professional life?

7. Has being a minority woman influenced your employmemt status and/or salary in any way?

Please send a resume with this survey. A postage-paid, return envelope is enclosed for your convenience.

# APPENDIX D

TABLE III. STATISTICAL PORTRAYAL OF SURVEY PARTICIPANTS
BY RACE, DISCIPLINE AND DEGREE LEVEL

| | BLACK | ASIAN | MEXICAN AMERICAN | NATIVE AMERICAN | NON-MINORITY | OTHER MINORITY | UNSPECIFIED RACE | TOTAL |
|---|---|---|---|---|---|---|---|---|
| **MATHEMATICS** | | | | | | | | |
| Bachelor | | | | | | | | 0 |
| Master | | | | | | | | 0 |
| Ph.D. | 2 | 2 | | | | | | 4 |
| **PHYSICS** | | | | | | | | |
| Bachelor | | | | | | | | 0 |
| Master | 1 | | | | | | | 1 |
| Ph.D. | 1 | 1 | | | | | | 2 |
| **CHEMISTRY** | | | | | | | | |
| Bachelor | 1 | | | | | | | 1 |
| Master | | | 1 | | | | | 1 |
| Ph.D. | 3 | 2 | | | | | | 5 |
| **EARTH SCIENCES** | | | | | | | | |
| Bachelor | | | | | | | | 0 |
| Master | 1 | | | | | | | 1 |
| Ph.D. | | | | | | | | 0 |
| Other | | | | 1 | | | | 1 |
| **ENGINEERING** | | | | | | | | |
| Bachelor | 1 | | | | | | | 1 |
| Master | | | | | | | | 0 |
| Ph.D. | | | | | 1 | | | 1 |
| Other | | 1 | | | | | | 1 |
| **ENVIRONMENTAL SCIENCES** | | | | | | | | |
| Bachelor | | | | | | | | 0 |
| Master | | | | | 1 | | | 1 |
| Ph.D. | | | | | | | | 0 |
| **MEDICAL SCIENCES** | | | | | | | | |
| Bachelor | | | | | | | | 0 |
| Master | 1 | 1 | | | | | | 2 |
| Ph.D. | 1 | 1 | | | 1 | | | 3 |
| **BIOLOGICAL SCIENCES** | | | | | | | | |
| Bachelor | | | | | | | | 0 |
| Master | 1 | | | | | | | 1 |
| Ph.D. | 10 | 5 | 1 | | | 1 | | 17 |
| Other | 1 | | | | | | | 1 |

Source: Compiled by Rachel Warner from National Network of Minority Women membership data.

TABLE III. STATISTICAL PORTRAYAL OF SURVEY PARTICIPANTS
BY RACE, DISCIPLINE AND DEGREE LEVEL (CONTINUED)

| | BLACK | ASIAN | MEXICAN AMERICAN | NATIVE AMERICAN | NON-MINORITY | OTHER MINORITY | UNSPECIFIED RACE | TOTAL |
|---|---|---|---|---|---|---|---|---|
| **PSYCHOLOGY** | | | | | | | | |
| Bachelor | | | | | | | | 0 |
| Master | | | | | | | | 0 |
| Ph.D. | 1 | | | | | | | 1 |
| **SOCIAL SCIENCES** | | | | | | | | |
| Bachelor | | | | | | | | 0 |
| Master | 1 | | | | | | | 1 |
| Ph.D. | | | | | | | | 0 |
| **ARTS AND HUMANITIES** | | | | | | | | |
| Bachelor | | | | | | | | 0 |
| Master | | | | | | | | 0 |
| Ph.D. | 1 | | | | | | | 1 |
| **EDUCATION** | | | | | | | | |
| Bachelor | | | | | | | | 0 |
| Master | 1 | 1 | | | | | | 2 |
| Ph.D. | 1 | | | | | | | 1 |
| **UNSPECIFIED FIELD** | | | | | | | | |
| Unspecified degree | | | | | | | 2 | 2 |
| TOTAL | 29 | 14 | 2 | 1 | 3 | 1 | 2 | 52 |

Source: See Page 1 of Table III.

TABLE IV. STATISTICAL PORTRAYAL OF SURVEY PARTICIPANTS
BY DISCIPLINE, STATE AND RACE

| | MATHE-MATICS | PHYSICS | CHEMIS-TRY | EARTH SCIENCES | ENGIN-EERING | ENVIRON-MENTAL SCIENCES | MEDICAL SCIENCES | BIOLOGI-CAL SCIENCES | PSYCHOL-OGY | SOCIAL SCIENCES | ARTS AND HUMAN-ITIES | EDUCA-TION | OTHER FIELDS | UNSPECI-FIED FIELD | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARIZONA | | | | | | | | | | | | | | | |
| Black | | | | | | | | | | 1 | | | | | 1 |
| CALIFORNIA | | | | | | | | | | | | | | | |
| Black | | | | | | | | 5 | | | | | | | 5 |
| Asian | | 1 | 1 | | | | 1 | | | | | | | | 3 |
| Mexican American | | | | | | | | 1 | | | | | | | 1 |
| COLORADO | | | | | | | | | | | | | | | |
| Native American | | | | 1 | | | | | | | | | | | 1 |
| CONNECTICUT | | | | | | | | | | | | | | | |
| Black | | | | | | | | 1 | | | | | | | 1 |
| DISTRICT OF COLUMBIA | | | | | | | | | | | | | | | |
| Black | | 1 | 1 | | | | | 1 | | | | | | | 3 |
| GEORGIA | | | | | | | | | | | | | | | |
| Black | 1 | | | | | | | | | | | | | | 1 |
| HAWAII | | | | | | | | | | | | | | | |
| Asian | | | | | | | | 1 | | | | | | | 1 |
| KENTUCKY | | | | | | | | | | | | | | | |
| Black | | | | | | | | 1 | | | | | | | 1 |
| MARYLAND | | | | | | | | | | | | | | | |
| Black | | | | | 1 | | 2 | 1 | | | | | | | 4 |
| Other Minority | | | | | | | | 1 | | | | | | | 1 |
| MASSACHUSETTS | | | | | | | | | | | | | | | |
| Black | | | | | | | | 1 | | | | | | | 1 |
| Asian | | | | | | | 1 | 1 | | | | | | | 2 |
| MICHIGAN | | | | | | | | | | | | | | | |
| Black | | | | | | | | | | | | 1 | | | 1 |
| Non-minority | | | | | | 1 | | | | | | | | | 1 |
| MINNESOTA | | | | | | | | | | | | | | | |
| Black | | | 1 | | | | | | | | | | | | 1 |
| MISSISSIPPI | | | | | | | | | | | | | | | |
| Black | | | | | | | | | | | | 1 | | | 1 |
| Non-minority | | | | | 1 | | | | | | | | | | 1 |

TABLE IV. STATISTICAL PORTRAYAL OF SURVEY PARTICIPANTS
BY DISCIPLINE, STATE AND RACE (CONTINUED)

| | MATHE-MATICS | PHYSICS | CHEMIS-TRY | EARTH SCIENCES | ENGIN-EERING | ENVIRON-MENTAL SCIENCES | MEDICAL SCIENCES | BIOLOGI-CAL SCIENCES | PSYCHOL-OGY | SOCIAL SCIENCES | ARTS AND HUMANI-TIES | EDUCA-TION | OTHER FIELDS | UNSPECI-FIED FIELDS | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MISSOURI | | | | | | | | | | | | | | | |
| Black | | | | | | | | | 1 | | | | | | 1 |
| NEW JERSEY | | | | | | | | | | | | | | | |
| Asian | 1 | | | | | | | | | | | | | | 1 |
| NEW MEXICO | | | | | | | | | | | | | | | |
| Black | | | 1 | | | | | | | | | | | | 1 |
| Mexican American | | | 1 | | | | | | | | | | | | 1 |
| NEW YORK | | | | | | | | | | | | | | | |
| Black | | 1 | | | | | | 1 | | | | | | | 2 |
| Asian | | | 1 | | | | | | | | | | | | 1 |
| NORTH CAROLINA | | | | | | | | | | | | | | | |
| Black | 1 | | | | | | | | | | | | | | 1 |
| OREGON | | | | | | | | | | | | | | | |
| Black | | | | 1 | | | | | | | | | | | 1 |
| Asian | | | | | | | | 1 | | | | | | | 1 |
| PENNSYLVANIA | | | | | | | | | | | | | | | |
| Asian | | | | | | | | 1 | | | | | | | 1 |
| SOUTH CAROLINA | | | | | | | | | | | | | | | |
| Asian | | | | | 1 | | | 1 | | | | | | | 2 |
| TENNESSEE | | | | | | | | | | | | | | | |
| Black | | | 1 | | | | | | | | | | | | 1 |
| Asian | 1 | | | | | | | | | | | | | | 1 |
| TEXAS | | | | | | | | | | | | | | | |
| Asian | | | | | | | | | | | | 1 | | | 1 |
| VIRGINIA | | | | | | | | | | | | | | | |
| Black | | | | | | | | 1 | | | | | | | 1 |
| Non-minority | | | | | | | 1 | | | | | | | | 1 |
| WISCONSIN | | | | | | | | | | | | | | | |
| Black | | | | | | | | | | | 1 | | | | 1 |
| UNSPECIFIED STATE | | | | | | | | | | | | | | | |
| -Unspecified race | | | | | | | | | | | | | | 2 | 2 |
| TOTAL | 4 | 3 | 7 | 2 | 3 | 1 | 5 | 19 | 1 | 1 | 1 | 3 | 0 | 2 | 52 |